

**The Knowledge Bank at The Ohio State University**  
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# Your Heating and Plumbing Problems

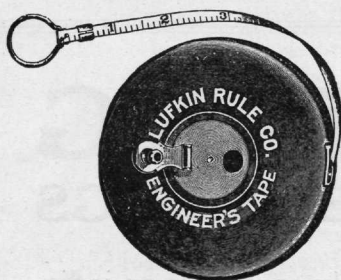
Our competent engineers are always ready to consult and advise you on any of your heating and plumbing problems.

And whether the undertaking is large or small, you may be sure that you will receive the same prompt and courteous attention.

## The Huffman-Wolfe Co.

661 NORTH HIGH STREET, COLUMBUS, OHIO

Citizen 7749; Main 2332



THE ENGINEERS' PATTERN

Popular with the engineers. A  $\frac{1}{4}$ " wide extra heavy steel tape in substantial metal-lined leather case. Also furnished in open disc reel and open metal frame.

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### LUFKIN TAPES

FOR ENGINEERS  
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Our line includes, also, a tape for every purpose, each one the best designed for its work.

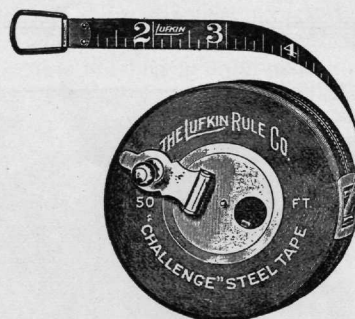
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**THE LUFKIN RULE CO.**

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THE "CHALLENGE"

Suitable for any measuring. A steel line in high-grade metal-lined leather case. Made with  $\frac{3}{8}$ " and  $\frac{1}{2}$ " wide line. Many highway departments prefer the  $\frac{1}{2}$ " and we recommend it for heavy service.

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EVERY engineer should know APOLLO Best Bloom and Apollo-Keystone Galvanized Sheets, American Bessemer and Open Hearth Steel Sheets; and KEYSTONE Copper Steel

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AMERICAN SHEET AND TIN PLATE COMPANY, Frick Bldg., Pittsburgh, Pa.

## Helps to Success

The Units of Equipment which Help, rather than Hinder, in the successful completion of any work, are those of correct design and careful building.

Units produced by The Hadfield—Penfield Steel Co., of Bucyrus, O., are so built and include—

### ***Diesel Engines***

### ***Gasoline Locomotives***

### ***Clay Products and Cement Machinery***

### ***One Man Graders for Fordsons***

### ***Crawler Tracks for Fordsons***

### ***Manganese Steel—"ERA" Brand***

**DIESEL ENGINES**—Product as much power on one car of oil as can be developed from ten cars of coal under boilers. No shoveling of coal or ashes. One-tenth freight. Cost starts when work starts.

**GASOLINE LOCOMOTIVES**—Built in several sizes. Economic motive power at minimum cost. No skilled help. Low upkeep cost.

**CLAY WORKING MACHINERY**—Full equipment for making every product made of clay. Also cement machinery.

**ONE MAN GRADER**—Attaches to a Fordson in an hour. One man cuts grading cost to one-fourth. Grades, scrapes, ditches, removes snow.

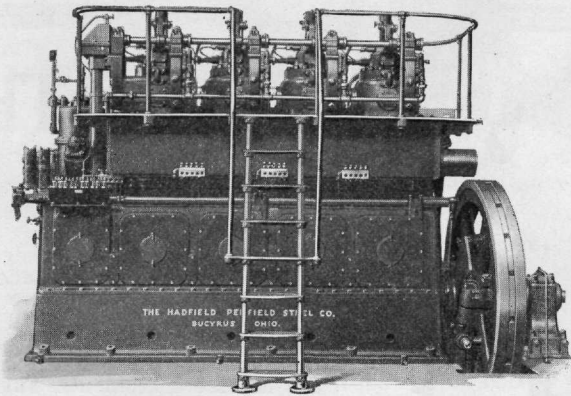
**CRAWLER TRACKS**—Make a Crawler of any Fordson. Doubles its pulling power. Goes anywhere. Ford service and low upkeep.

**MANGANESE STEEL**—For repair parts "ERA" brand has no equal. Extra life without extra cost.

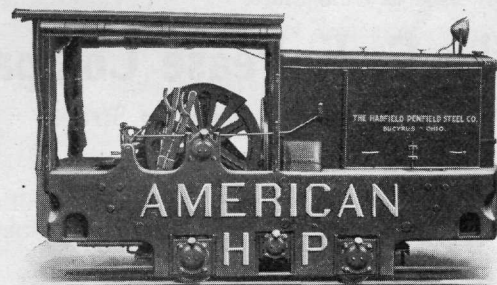
We have other activities and invite correspondence.

**The Hatfield-Penfield Steel Co.**

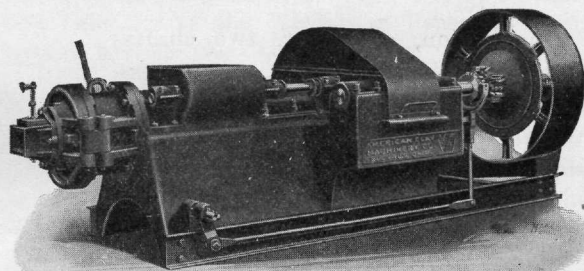
BUCYRUS, OHIO



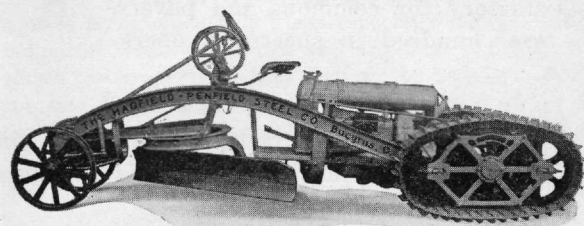
200 Horse Power Diesel Engine



Gasoline Locomotive



No. 290 Auger Brick Machine

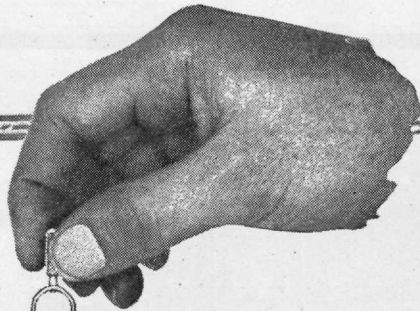


One Man Grader and Trawler Tracks for Fordson  
Can be used Separately or Together



THE HADFIELD-PENFIELD STEEL COMPANY  
BUCYRUS, OHIO





## The Result of 25 Years' Experience

The expert who designed Pease drawing instruments and who supervises their construction, has made drawing instruments in the oldest factories of Europe and America. They have been his life's work and when he set out to make Pease instruments, he had a thorough knowledge of the mechanical details of every make of instrument on the market, both domestic and imported. Hence, the superior features in design and construction, found only in Pease instruments, are not mere accidents, but are the result of twenty-five years' experience.

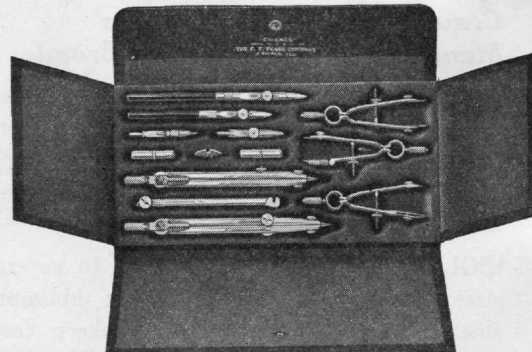
There are many equally important features such as interchangeability of parts which we would like to tell you about. Literature and prices will be gladly sent on request, and your money will be promptly refunded if you are not completely satisfied with Pease drawing instruments after using them. Write for circulars describing our "Franklin" Brand which is being largely used at Ohio State.

### The C. F. Pease Company

834 North Franklin Street  
Chicago

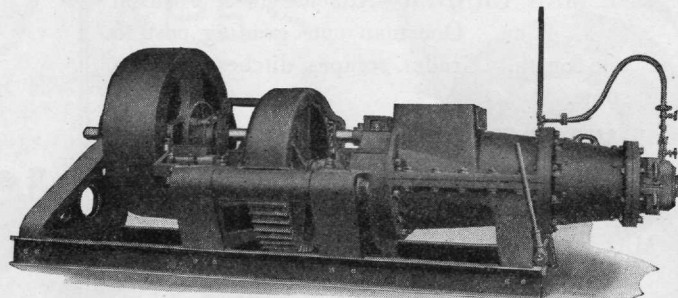
Blue Printing Machinery  
Drafting Room Supplies

Drafting Room Furniture  
Drawing Instruments



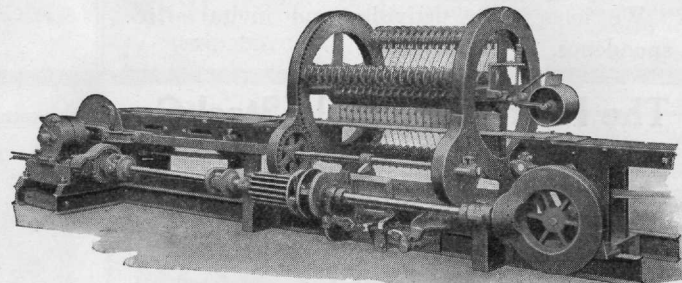
### Auger Brick Machine

One pinion, one gear, two shafts; detachable thrust bearing. As accessible as a brick machine can be built. We also build the Union Machine—an augur machine and a pug mill in one construction.



### Rotating Automatic Cutter

Producing the highest grade face brick, without repressing. Equally satisfactory for commons and pavers. Several hundred in successful operation.



We manufacture a complete line of auger machinery, having given our attention exclusively to this one class of machinery for over forty years.

**E. M. FREESE & COMPANY, Galion, Ohio**  
*DEPENDABLE MACHINERY OF PROVEN EFFICIENCY*



## After you've done your best— What then?

**T**HE day is not far off when you may be in charge of plant production. Your first duty will be to take the equipment you have and bring production up to the highest possible level.

Let's suppose you've done that. Machines are in good order. Work is properly scheduled. Time studies have been carefully made. Yet costs are still too high.

Then the only solution will be to get new machines which can do the work faster at lower power and labor costs.

Such machines as the Brown & Sharpe No. 21 Automatic Milling Machine have done wonders in speeding up production and lowering costs.

Get acquainted with this machine now. Write for this fully illustrated book describing the machine and several typical jobs on which it has cut costs. Send for your copy today.



**BROWN & SHARPE MFG. CO.**  
Providence, R. I., U.S.A.



## INDUSTRIAL BUILDINGS SHOULD BE WELL LIGHTED.

From the employer's viewpoint, the big difference between men who work out of doors and those who perform tasks inside the building, is the factor of light. Daylight furnishes sufficient illumination outside during the daytime working hours for men to pursue their tasks efficiently and safely. But the proposition of getting enough daylight into the interior of industrial buildings, requires some thought.

It is not a difficult problem by any means, and any employer can take advantage of daylight and utilize it for lighting his building during the daytime, if he desires. It is an excellent light, especially suitable for the eyes, reducing eye strain and eye weariness to a minimum, and has the great economic advantage of costing nothing.

To utilize daylight to the utmost, we must first provide means for allowing daylight rays to enter the interior of buildings in sufficient quantity—namely, proper and adequate windows and skylights. Many excellent instances of buildings designed with a due regard to the importance of daylight lighting can now be seen in many of our industrial cities. Such buildings present the appearance of being practically all windows—"window walled," as they are termed—and this type of daylight construction is coming rapidly into favor, because it constitutes a more healthy building for large numbers of employes, both from the lighting and ventilation standpoints.

Among those who have constructed this type of modern industrial building may be mentioned: The Shredded Wheat Co., Gillette Safety Razor Co., Lyon & Healy Piano Co., H. J. Heinz Co., Corona Typewriter Co., Skinners Macaroni Co., Grape Juice Co., Dodge Bros., Nelson Valve Co., Piston Ring Co., Remington Arms Co., and a great many others.

The Larkin Co., Philadelphia, has erected a building almost entirely glass, 85% being windows, and the Loomis Breaker, operated by the D. L. & W. R. R. Co., Nanticoke, Pa., is literally a glass house, being 93.5% of glass. The new buildings of the Winchester Repeating Arms Co. have an average glass area of 58%.

An investigation covering 18 buildings constructed by the Aberthaw Const. Co., Boston, shows that the average window area is 57.5%.

These figures indicate how important the subject of lighting is now considered by employers of industrial labor, and how well the idea has been carried out by the architects and engineers, in order that all parts of a building may receive sufficient daylight. But, in addition to providing ample window space, there is another factor which is equally important, and that is, equipping the windows with the proper glass.

The bright direct rays of the sun should not be permitted to strike the eye, and we must provide a means for reducing the glare to rays which will not be too bright. This is accomplished by glass especially manufactured for industrial windows, known as Factrolite. This glass possesses the property of breaking up the intense rays of the sun and diffusing the light into the interior of the building in proper portions, solving the problem of sun glare.

If you are interested in the distribution of light through Factrolite, we will send you a copy of Laboratory Report—"Factrolited."

**MISSISSIPPI WIRE GLASS CO.,**

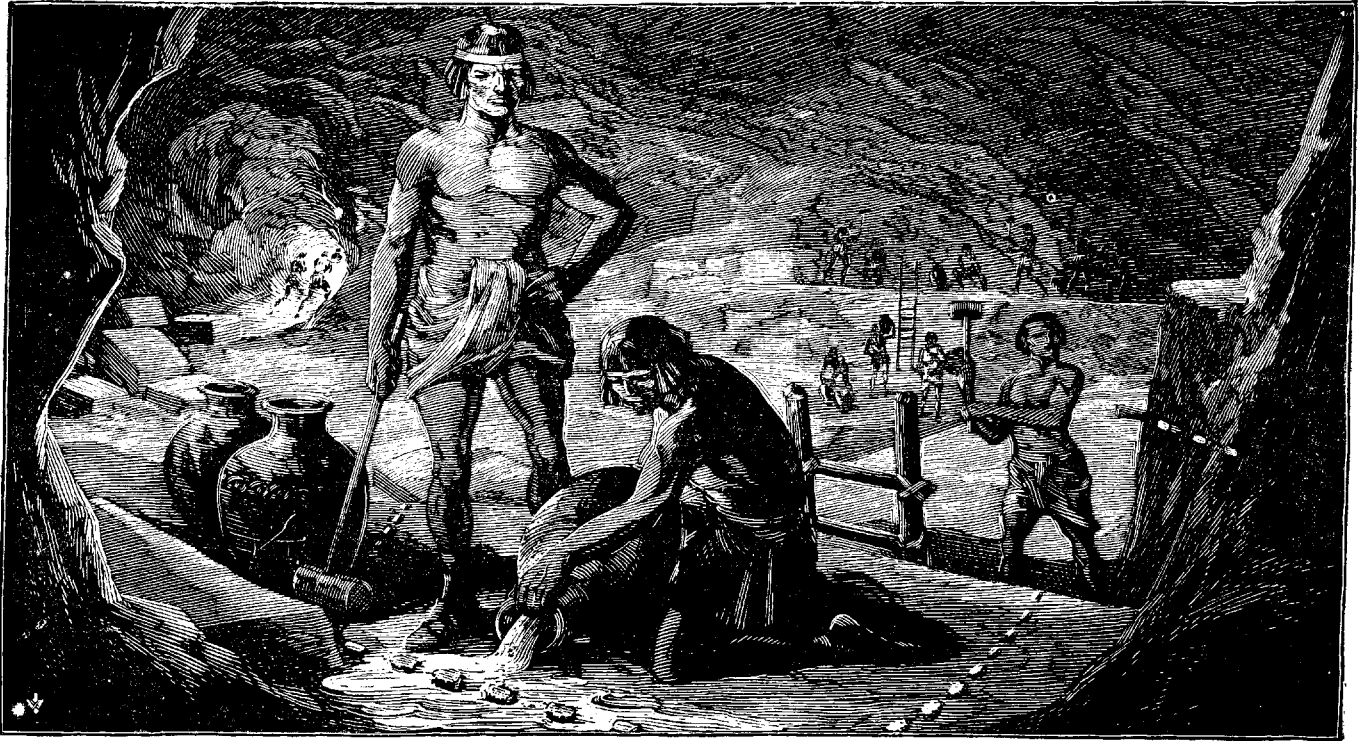
220 Fifth Avenue,

St. Louis.

New York.

Chicago.





## *Mining for King Solomon's Temple*

Eighty thousand workmen with the quarrying tools of antiquity toiled in the subterranean quarries from which King Solomon obtained the pure white stone for his Temple—began in 983 B. C.

Channels, to mark the dimensions of the blocks, were grooved in the rock wall with picks, crudely fashioned of bronze. The Egyptian method of breaking out the rock was used: into a niche cut in the stone, a dry wooden wedge was pounded and water poured in upon it. The swelling of the wood forced out the block.

The rough and smooth ashlar of which the temple was built was worked down to the desired size in these caverns. Seven

years were consumed in building the temple.

At a modern copper mine, 47,000 tons of ore have been produced in one day with the aid of Hercules Explosives. And more than 25 million pounds of Hercules dynamite have been used at this mine without a single accident due to the explosives.

King Solomon's craftsmen labored for many days to accomplish as much as one pound of Hercules dynamite will now do for you in a moment.

Write to our Advertising Department,  
King Street, Wilmington, Delaware,  
for a book on Hercules Products.

# HERCULES

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## POWDER COMPANY

Allentown, Pa.  
Birmingham, Ala.  
Buffalo, N. Y.  
Chattanooga, Tenn.

Chicago, Ill.  
Denver, Colo.  
Duluth, Minn.

Hazleton, Pa.  
Huntington, W. Va.  
Joplin, Mo.  
Los Angeles, Cal.



Louisville, Ky.  
New York City  
Norristown, Pa.  
Pittsburg, Kan.

Pittsburgh, Pa.  
Pottsville, Pa.  
St. Louis, Mo.

Salt Lake City, Utah  
San Francisco, Cal.  
Wilkesbarre, Pa.  
Wilmington, Del.



# A Record Still Unbroken



*At 5:20 P. M., March 8th, 1920, Westinghouse Turbine Established World's Record for Continuous Running.*

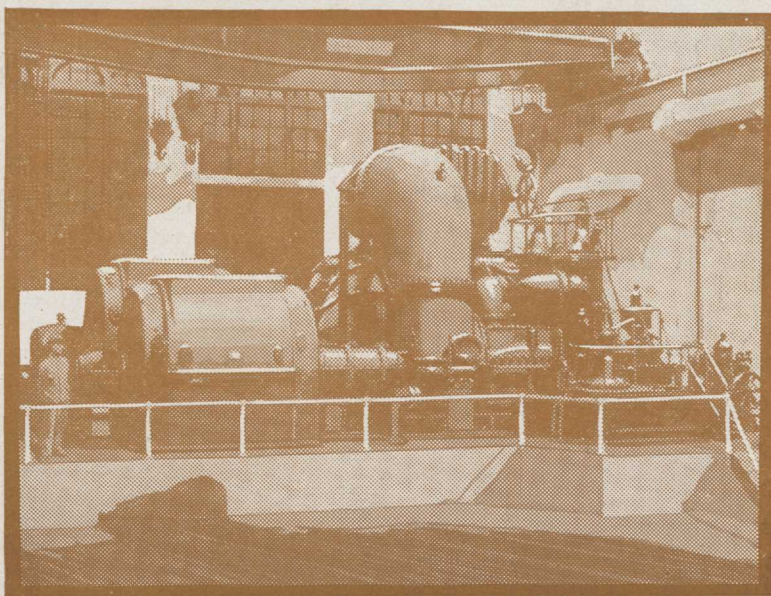
## What Engineering Owes to Good Workmanship

WHEN Westinghouse installed a 45,000 K. W. Turbine in the power house of the Narragansett Electric Light Company, Providence, R. I., early in December, 1919, there was no thought of more than the average weekly power house run. Abnormal weather conditions, however, brought so steady a demand for power, that the unit was not shut down until March 8th, 1920, after a continuous run of 84 days, 11 hours, and 36 minutes.

This was especially remarkable in that the unit consists of two turbine generator sets, each of which operates independently of the other, so that the result was the mechanical equivalent of operating a single machine continuously for 169 days.

If space permitted, many astounding figures could be cited—about the K. W. H. generated during this period, the water and coal used, the cooling system, the oiling system, etc.

For example, to keep the generators cool, over 18,000,000,000 cubic feet of air passed through them, which equals 2,000 times the total weight of the generators and their bed plates.



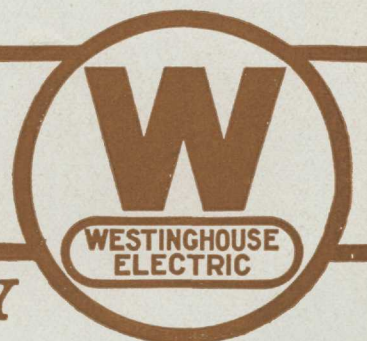
*45,000 K. W. Westinghouse Cross-Compound Turbine Unit at the Station of the Narragansett Electric Light Company, Providence, R. I.*

Equally impressive, oil was pumped through the self-contained lubricating system to the bearings at the rate of 600 gallons a minute. Had the oiling system failed for only 30 seconds, the bearings would have been wrecked, and other parts of the unit harmed!

There is interesting history back of the operation of Westinghouse Turbine Units of 3,000 K. W. and higher. Notable records have been made in many of the world's great power plants, performance that is a tribute to remarkable engineering and good workmanship.

# Westinghouse

## ACHIEVEMENT & OPPORTUNITY







BENJAMIN FRANKLIN  
1706-1790

Printer, journalist, diplomat, inventor, statesman, philosopher, wit. One of the authors of the Declaration of Independence and the Constitution, author of Poor Richard's Almanack; and one of the most eminent natural philosophers of his time.

## But nobody had thought to do it

By bringing electricity down from the clouds over a kite string, it was a simple thing to prove that lightning was nothing more than a tremendous electrical flash.

For centuries before Franklin flew his kite in 1751 philosophers had been speculating about the nature of lightning. With electrified globes and charged bottles, others had evolved the theory that the puny sparks of the laboratory and the stupendous phenomenon of the heavens were related; but Franklin substituted fact for theory — by scientific experiment.



Electrical machines bearing the mark of the General Electric Company, in use throughout the world, are raising standards of living by doing the work of millions of men.

Roaring electrical discharges, man-made lightning as deadly as that from the clouds, are now produced by scientists in the Research Laboratories of the General Electric Company. They are part of experiments which are making it possible to use the power of mountain torrents farther and farther from the great industrial centers.

# GENERAL ELECTRIC

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